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By-Hahn, Marshall

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This literature review on creativity covers 92 references dating from 1906 to 1966. It is one of a series on topics pertinent to vocational, technical, and practical arts education. Major units of the review are Defining Creativity, Measuring Creativity, Creativity and Intelligence, Characteristics of the Creative Individual, Teaching and Creativity, and Inhibitors of Creativity. (EM)

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Review of Research on

CREATIVITY

Minnesota Research Coordination Unit
in Occupational Education

University of Minnesota, Minneapolis, Minnesota

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Review of Research on CREATIVITY

by Marshall Hahn

SEPTEMBER 1968

Minnesota Research Coordinating Unit in Occupational Education
University of Minnesota, Minneapolis, Minnesota

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FOREWORD

This publication is one of a series by the Minnesota Research Coordination Unit in Occupational Education designed to analyze, synthesize, and disseminate the results of research in problem areas of concern to the vocational, technical, and practical arts fields. The series is open-ended. Individual publications are born when the interest and competence of a prospective author are perceived to be compatible with the needs of the fields.

In this case, the author, Dr. Marshall Hahn, completed his dissertation in the area of creativity; it was the most recent effort in a long line of dissertations and staff studies on creativity conducted in the Department of Industrial Education and in the College of Education at the University of Minnesota. Since vocational, technical, and practical arts educators should become (if they are not already) concerned about the development of the creative talents of their students, since they are apparently in a potentially advantageous position to do something about that development, and because no information has recently been made available to them to help guide their efforts, this review was undertaken.

The staff of the Research Coordination Unit sincerely hopes that the information provided will help to improve the immediate and/or future practice of vocational, technical, and practical arts education.

Jerome Moss, Jr.
Howard F. Nelson
Co-directors

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INTRODUCTION

Educational and psychological problem areas have a strong tendency to remain more or less dorment for many years, then to suddenly emerge as critical issues and popular research problems. No problem illustrates this tendency more clearly than does the area of creativity. Prior to 1950, creativity as a subject for research and study was largely ignored. But in that year, Guilford, a psychologist at the University of California, in an address to the American Psychological Association, called to the attention of the members the apparent lack of interest in creativity. He noted that of 121,000 titles listed in Psychological Abstracts, only 186 were found to deal with the subject of creativity.

During the same address, Guilford outlined the method by which he planned to study the subject. He suggested that creativity might logically be studied as a part of his "structural model of intellect". In spite of Guilford's address and subsequent writings, the situation remained nearly static until 1954. Since that time, however, a great deal of interest has been expressed in and research undertaken on the subject.

Creativity, perhaps more than any other human quality, is vital to the shaping of man's future. It seems apparent that a society, in order to insure its continued survival and growth, must provide a climate which permits the creative potential of individuals to emerge and develop. American industry, for instance, has rewarded the creative thoughts and products of individuals for many years, and, partly because of this, has grown into one of the strongest and most complex structures in the contemporary world. To some extent the need for an environment conducive to creativity has also motivated the schools to reward creativity in students. Yet it is probable that the schools are not doing enough. Often it appears that the highly creative members of our society have discovered their talents by accident, and developed these talents through self-determination and individual initiative, rather than by design through the schools.

Why should the formal educational structure, so largely designed for the education of the many, devote its attention to the development of characteristics displayed by only a few? There is every reason to believe that creativity, as it is understood today, represents a trait that is found to some extent in every individual. As with other forms of intelligence, creativity is neither exhibited in individuals in equal measure, nor can it be accounted for or described by a single characteristic.

Creative individuals are essential to our society, and creative potential appears to exist to some extent in every individual. But merely to recognize these facts is not in itself sufficient. There is an urgent need to nurture man's creative potential through study, analysis and implementation of the findings of research.

More specifically, the task for educators and researchers, either through insight or through efficient and effective predictive devices, is to identify creative talent, and to provide the kind of total environment which will facilitate its development and expression. Teachers and administrators must

plan systematically to organize instruction and educational opportunities so that all students will be motivated to develop their creative abilities. Wherever creativity is now being developed by chance, it must, in the future, be promoted by careful planning and design.

DEFINING CREATIVITY

There are many meanings to the word "creativity". It has been variously defined as (a) a product (an invention or discovery), (b) a process, (c) a kind of person (the creative individual), or (d) a set of conditions. Typically, the condition often specified in definitions has been that something new be established, although whether it need be new for society or only for the individual has often been debated. However, most investigators of creativity seem to agree on a definition that indicates the newness of the product, process or set of conditions for the individual concerned.

Torrance (1966b), one of the most prolific of writers on creativity, has defined creativity as:

> ...the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypothesis and possibly modifying and retesting them; and finally communicating the results.

Torrance further stated that this definition seems to describe the natural process that takes place during the creative act. He argued that any definition of creativity should be in harmony, at least to some extent, with historical usage, yet at the same time useable or applicable to scientific, literary, artistic and personal creativity. Ausubel (1963) has disagreed with Torrance's notions indicating that they fail to distinguish between creativity as a highly specialized and substantive capacity and creativity as a generalized grouping of personality variables, intellectual and problem solving abilities. Torrance concurred that his definition identified a constellation of intellectual and problem solving abilities and countered that, the higher the constellation of general abilities, the more probable are the chances for an individual to display creative ability of a substantive capacity when the opportunity arises.

Ribot (1906), in his classic work, The Creative Imagination, stated that man is creative, or able to create, because of (a) the motor activities produced by appetites, tendencies and desires, and (b) the possibilities of spontaneous revival of images that become grouped in the new combinations. Wertheimer (1945) similarly proposed that creative thinking is the successful transposition of a member from one configuration to another.

Some investigators place more stress on the purposefulness or goal-directedness of the process to distinguish it from idle phantasy or daydreaming. Warren's Dictionary of Psychology (1934) defined creativity as "the capacity of certain persons to produce compositions of any sort which are essentially novel or which were previously unknown to the producer." The latter phrase, "...which were previously unknown to the producer," has caused a good deal of consternation among researchers.

Bartlet (1959) employed another term, "adventurous thinking", which he characterized as getting away from the mainstream, being open to environment and

experience, and letting one thing lead to another. Simpson (1922), defined creative ability as the intuition which one manifests by his power to break away from the usual thought routine and into an altogether different pattern of thought.

Additional useful definitions of creativity are those of the following writers. Stein, for example, (in Taylor, 1964b), wrote that, "a process is creative when it results in a novel work that is accepted as tenable or useful or satisfying to a group at some point in time." Others have argued that consideration must be given not only to social but also to individual creativeness; the creativeness of the individual who makes for himself something that others, unknown to him, have made before, as well as the individual who produces something new. Spearman, (in Drevdahl, 1954), maintained that the primary method of creative thought is the deducing of correlates, the transplanting of an old relation, and in consequence, the generation of a new correlate.

Rossman (1931) has proposed that invention is merely the combination of old elements into new arrangements, and inventors differ from non-inventors in their originality only in terms of their psychological reactions to deficiencies in man's handiwork. He also has stated that background knowledge in a particular field has become increasingly more important in creative work.

In a series of articles and reports, Guilford (1950, 1959, and in Taylor, 1964), presented a theory of creativity that is based upon the concept of "primary traits": dimensions of personality along which "individuals differ systematically" and which, it is assumed, individuals possess "in common but to different degrees." The various traits were educed inductively through factor analysis of the theoretical "structure of intellect model". Guilford made no claim that either his model or his theory was an all-inclusive one; creativity is, after all, only one of the phenomena to which the structure of intellect is applied. He conceived of creativity as a complex component of talents and temperaments. For Guilford, the most important component of creativity seems to be the divergent aptitude.[1] He does not deal with the theory of self-actualization and universal creativity for all, but has tried to isolate single specific tasks that would involve single specific traits of creativity.

In the area of occupational education, there are few concrete definitions for creativity. However, Moss and Bjorkquist (1965) have formulated a definition of creativity for industrial arts. In part, they stated:

> ...When a student has organized his past experiences in such a manner as to reach an unusual and useful solution to a perceived problem, he has formulated a creative idea. When the idea is expressed in an observable, overt form, he has developed a creative product. A student's creative ability is evidenced by (a) the relative degree of unusualness and usefulness of each of his products, and (b) the total number of his creative products.

---

[1] Divergent thinking can be described as thinking that moves away from facts or knowledge already possessed.

The two authors restrict creativity to products so that it can be measured in the school shop situation. They stipulate that, in order to measure creativity in the school situation, their definition cannot include those products unique only to the individual himself because of its first occurance. This they reason "...would make creativity indistinguishable from problem solving and even learning, since the definitions of problem solving and learning require non-habitual behavior from the individual."

Other concepts, such as curiosity, imagination, originality, discovery, innovation and invention are also prominent in the literature on creativity. Creativity has even been defined by contrasting it with another concept like conformity. Yet it is clear that no single definition has been derived that is agreeable to all researchers. In fact, not even all researchers in the same field agree on one single definition. In order to move ahead with needed research on this problem area, Taylor (1964a) has urged researchers to choose a tentative definition or to develop a definition of their own. Toward this end this writer proposes the following definition which may be general enough to be applicable in the typical classroom situation: "Creativity is the ability and initiative to create new ideas and/or things by the restructuring or redefining of past experiences into new forms."

MEASURING CREATIVITY

The creative act is never an act in isolation or the sole product of a flash of momentary inspiration. Masterpieces in any field are usually end products, often developed after much trial and error, during which time the understanding, skills and facts necessary to achieve the objective of the creative impulse are acquired. Creativity is a complex concept which can be exhibited in many different ways and in many different media. The findings of research to date indicate that a variety of methods have been developed for measuring this phenomenon.

Measurement of creativity has been concentrated in two areas: one, the measurement of creative potential, and the other, the measurement of creative performance. In order to measure these two aspects of creativity, a variety of procedures have been developed. Most of the developments in the measurement of creativity resulted from experimental research and have found their widest application in a research context.

One of the first recorded incidents of a method of collecting data for the rating of individuals dates back to Leonardo da Vinci who designed what might be termed a test of creativity to aid in the selection of potential art students. He observed that the physical and mental traits of his students were portrayed in the pictures they painted.

Guilford, as previously noted, is most often credited with giving impetus to the research on creativity since 1950. But several earlier researchers investigated some of the ramifications of creativity. These researchers suggested that the new instruments designed to measure "creativity" or "creative thinking" abilities were measuring aspects of mental performance different from those measured by intelligence tests.

As early as 1900, Kirkpatrick used a series of ink blot tests with elementary school children to measure creativity. In 1902, Colvin devised a composition test which was scored on the basis of invention, sense of humor, imaginative power, feeling and perceptive power (Torrance, 1962a).

Some research has also been completed using pre-school children. In general, this research has used the creative response type of scribbling, drawing and verbalizing while in a problem solving situation. The findings suggest that there is little relationship between creativity, as measured in these situations, and traditional measures of intelligence.

Many devices have been developed and tested in an effort to more accurately measure the trait of creativity. Most researchers agree that there is no single trait or characteristic for creativity that can be scored to yield a score or quotient similar to that most often associated with intelligence measures. However, in his structure of intellect model, Guilford had identified 60 different traits, among which are those termed "creativity traits". These, derived through factor analysis, all deal with creativity, and fall under three major content headings: fluency, flexibility and elaboration. They have been described by Guilford as follows:

> Fluency is the facility with which one can retrieve information in storage in the brain from past experiences.
>
> Flexibility is the facility to use a variety of approaches to the solution of a problem.
>
> Elaboration is the facility to fill in details after an idea has been formulated.

Guilford (1966) further described three types of fluency and two types of flexibility. Theoretically, a fourth type of content, known as behavioral content (which concerns the "psychological disposition of observed individuals") could also be included. Thus, from four sets of divergent content areas and six abilities within each content area, twenty-four theoretical abilities in the general category of creativity are formed. Sixteen of these abilities have been empirically investigated and tests have been devised for experimental research use.

Getzels and Jackson (1962) adapted several of Guilford's tests and added some of their own to make up a battery of creativity tests. The two researchers have used this test battery to identify a group of highly creative students in a private school.

Torrance (1962a) has adapted the first two forms of his creative thinking tests to the model proposed by Guilford and to the tests with which Guilford proposed to measure divergent thinking. Torrance designed the tests for children using tasks that encompass the entire creative process. These differ from Guilford's tasks which were developed to test single factors. By varying the tasks, Torrance obtained different sets of responses. Several methods of analyses were used to obtain measures for each of the different abilities tested. In the analyses, responses were assigned values based upon their probability of occurance.

More than twenty-five tasks, both verbal and non-verbal, have been identified and employed by Torrance to experimentally test a large range of subjects from kindergarten through college. The tasks are presumed to assess the creative thinking abilities involved in producing a product. The emphasis in this research has been on assessment of a product, rather that on direct measurement of thought or the cognitive process which results in a final product. The Torrance Tests of Creative Thinking (1966b) have recently been published. In the manual which accompanies these tests, the author states:

> Both the publisher...and the author are aware that this publishing step is being taken while knowledge and understanding about creative thinking are yet in a relatively underdeveloped state. Under these conditions assessment cannot have reached the level of technical excellence that is eventually desired for it. On the other hand, publication of creative thinking tests in their present condition should encourage research, facilitate data gathering and accomplish the very widening of knowledge in the area that is so urgently needed.

Guilford's instruments for measuring creativity were developed for evaluation of scientific personnel and their products. Torrance has completed a major portion of his research work with elementary school children, but has also adapted several of his tests for use with high school and adult subjects with some degree of success.

There are available today a number of different tests which have been used in a wide variety of situations for the assessment of creativity. Several of the creativity tests currently available to educators are: (a) The AC (Spark Plug) Test of Creative Ability, (b) Burkhart's Divergent Question Test, (c) Fredricksen's Formulating Hypotheses Test, (d) Mednick's Remote Association Test, and (e) The Runner Studies of Attitude Patterns. The use of creativity tests to identify creative individuals is not error-free. Creative individuals often do not perform creatively on tests because of the pressure of time, the necessity to respond in writing, or because of poor reading habits and the lack of verbal facility.

Teachers can recognize creativity in children if they are aware of the variety of ways in which it is exhibited. Often this necessitates a reassessment of the teacher's own values and concepts regarding creativity. Creative behavior is often incorrectly regarded as undesirable or misguided behavior. Torrance (1963b) lists many non-test indicators of creativity to help the teacher who must use non-test methods of identifying the creative individual. Some of these indicators of creativity are:

Curiosity
Originality
Courageous behavior
Non-conforming behavior: (not bothered by pressure to conform)
Bent on experimentation
Unwillingness to give up
Preoccupation with an idea
Going beyong assigned tasks

CREATIVITY AND INTELLIGENCE

The Lorge-Thorndike Intelligence Test, The Differential Aptitude Test Battery and The Otis Quick-Scoring Mental Ability Test are among the traditional instruments for measuring general intelligence. Standardized intelligence tests such as these have come under increased criticism in recent years. One of the criticisms frequently leveled is that they are not adequate instruments for identifying creative individuals. It is interesting to note that this criticism (that high scores on standardized intelligence tests do not necessarily imply high creative productivity), was discussed as early as 1927 in an article by J. G. Rockwell.

Discussing creativity and intelligence, Guilford (in Burt, 1962) has noted that:

> If correlations between intelligence test scores and many types of creative processes are only moderate or low --and I predict they will be--it is because the primary abilities represented in the tests are not all-important for creative behavior, and some of the primary abilities important for creative behavior are not represented in the tests.

Traditional intelligence tests measure only a few of the so-called "dimensions of the mind" identified by Guilford. By 1961, he had identified 60 intellectual factors out of a theoretical total of 120 mental abilities stipulated by his structure of intellect model and had devised nearly 150 tasks designed to measure these 60 abilities. By contrast, the typical intelligence test normally samples from 6 to 8 of the 120 mental abilities identified by Guilford.

Guilford's position regarding IQ and creativity is supported by the research of Getzels and Jackson (1962). In their study, they found, among other things, that there was a "relatively low relationship between IQ measures and measures of creativity, at least at the IQ level of these subjects." The mean IQ of the two experimental groups was above the average for most public schools across the country.

Torrance undertook eight partial replications of the Getzels and Jackson study. Five of these replications were conducted at the elementary level, one at the high school level, and two in a graduate school situation. The mean IQ scores on the several intelligence tests employed in these studies ranged from 113 to 152. The two graduate groups using the Miller Analogies Test raw scores had mean scores of 68 and 72 respecitvely. (Although the scores appear to be lower this is due to the difference in rating scales of the two types of tests.)

In each school, Torrance used the same procedure followed by Getzels and Jackson. Those who ranked in the upper 20 per cent on tests of creativity, but not in the upper 20 per cent on tests of intelligence were designated as the "high creative" group, and those who ranked in the upper 20 per cent on tests of intelligence but below the upper 20 per cent on tests of creativity were considered the "high intelligence" group. Those who ranked in the upper 20 per cent on both measures were excluded from the study. The results generally tend to support the findings of Getzels and Jackson. In two schools, Torrance

obtained contradictory results, but he postulated that the schools, one in a small town and the other a parochial school, tended to advocate a rigid authoritarian approach to education which might have had a stifling effect upon creativity. He also noted that the average IQ in both schools was lower than the average in the other schools tested.

The tendency to link creativity with intelligence is quite common. The individual thought to be highly creative is also thought to have a high IQ. The very concept of giftedness is most often conceived in terms of IQ. Beginning with the Getzels-Jackson study, and reinforced by other research, this concept has been somewhat refuted. It is necessary to note, however, that the two factors have not been shown conclusively to be mutually exclusive.

In a recent experiment, Hahn (1967) found the correlation between verbal IQ scores, as measured by the Differential Aptitude Test, and creativity scores, as measured by total scores from the Minnesota Tests of Creative Thinking, Abbreviated Form VII, to be .0067. The experiment employed a sample of 10th, 11th, and 12th grade boys representing a wide range of intelligence. (The sample included individuals from each decile between the lowest and the highest percentile defined by the DAT manual).

This should not be interpreted to mean that there is no relationship between general intelligence and creativity. Mentally retarded individuals have not appeared among any of the highly creative adult groups identified in studies by MacKinnon, Roe, Barron, Guilford or Torrance. These studies indicate that a certain degree of intelligence is required for creativity, but that increased intelligence above this certain minimum level, which varies from field to field and may be fairly high, but in some instances is surprisingly low, does not guarantee a corresponding increase in creativity. It has not been demonstrated that the more intelligent individual is necessarily the more creative one as well.

Several researchers have speculated about the IQ level at which higher IQ scores will not correlate with an increase in creativity. On the basis of personal observation and the research reports of Roe, Heinze and others, Torrance has suggested that this minimum level IQ might be placed at about 120. He also pointed out that there is not much chance that an individual with this level of IQ would be included in programs for the gifted, which usually have a prerequisite IQ of 135, 140 or even higher.

Torrance has suggested that, in the light of recent research findings, teachers re-examine and revise their objectives to include thinking as well as learning, and to develop instruments for assesing creative thinking objectives. In addition to the needs in the school situation, measures of creative thinking abilities are needed to supplement measures of IQ in the selection of high level personnel in industry, government and education.

In summary, a large number of different IQ measures have been matched with almost as many creativity tests, and the findings, although somewhat varied, tend to support the following conclusions:

1. High IQ and creativity are not synonymous (Getzels and Jackson, 1962).

2. The coefficients of correlation between intelligence and creativity measures are rather low, ranging from .20 to .40 for unselected populations and quite low (zero and into the negative area) for selected, highly intelligent populations (Yamomoto, 1960).
3. Intelligence, as measured by standard instruments of today, has been found to be more complex in its relationship with creativity than had previously been expected (Eisner, 1963).
4. The correlation coefficient usually ranks lower for the relatively factor-pure tests of IQ,such as verbal comprehension (Burt, 1962; Hahn, 1967).

CHARACTERISTICS OF THE CREATIVE INDIVIDUAL

Although it may be that all persons exibit a certain amount of creativity, it is apparent that some are more creative than others. The findings of many studies have given rise to a detailed listing of the characteristics of these more creative individuals. Care must be exercised in the interpretation of these findings so that no one descriptive characteristic be considered a complete description of a person thought to be creative. Further, it would not be expected that two individuals who have developed similar characteristics would have developed them to the same degree. No single characteristic can completely describe the creative individual and it is doubtful whether all the characteristics of the creative person have been determined.

Of all the studies completed to date, perhaps the study by Roe gives the most basic description of the creative individual. Roe had indicated that the most common trait of leading creative artists was their "willingness to work hard and to work long hours" (in Gardner, 1963). Barron's comment (1966) that "discipline of form,tireless re-writing and shaping up, and a touch of the old shoemaker's pride in craftsmanship"..were among the characteristics of creative writers, supports the conclusion by Roe. MacKinnon (in Razik, 1966) wrote of his research findings on creative adults: "Creative people have an inordinate drive toward their work...; they also have an intense commitment to what they choose to do." This does not imply that every task will be attacked with the same vigor. However, when they choose a problem on their own volition in an area of their creative striving, their independence of thought and autonomy of action will be revealed.

Dervdahl and Cattrell (1958), in a study of creative artists and scientists, concluded that the creative individual appears to be a withdrawn and sophisticated person who is less interested in people than in things. Conceivably the creative individual's preoccupation with things rather that people allows him more time and energy to devote to his work.

If teachers are able to recognize the characteristics that are descriptive of the more creative person, then it is possible for the teacher to begin to channel the energy of the individual into useful purposes. But obviously the teacher can do little to nurture a particular creative talent until he can recognize the characteristics and potential of students with these talents. Teachers must be made more aware of the characteristics of creative individuals

and the techniques for identifying and developing these characteristics.

Torrance (1962a) has listed some 84 traits or characteristics of creative individuals. These traits can serve as guides for differentiating the highly creative individual from the less creative individual using personality measurement instruments and life experience inventories. Several of the descriptive traits, based upon the accumulated findings of research studies, are listed below.

The creative individual is thought to be:

1. Acceptive of disorder
2. Adventurous
3. Always baffled by something
4. Defient of conventions of health
5. Disruptive of organization
6. Energetic
7. Full of curiosity
8. Independent in thinking and judgement
9. Intuitive and original
10. Odd in habits
11. Persistent
12. Self-assertive
13. Self-confident
14. Not interested in small details
15. Stubborn

Three traits identified as being descriptive of creative individuals have been selected and elaborated on in more detail.

Independence of Judgement

The creative individual is usually not impressed by the authoritarianism of teachers or administrators. In fact, he is sometimes stubborn, temperamental and tenacious about his independent thoughts. He appreciates the opportunity to figure things out for himself but does not appreciate dealing with details concerning when and how to accomplish a task. Torrance (1962a) pointed out that the creative student is more often unwilling to accept authority on mere "say-so" and would rather "take a chance" on his judgement. This is especially true if the chance he takes is based upon his own ability and workmanship. He is strongly motivated to achieve in situations where his independence of thought and action are called for. The creative individual seeks the truth in whatever problem he undertakes and regardless of other's views.

Originality and Intuitiveness

The highly creative individual sees many ordinary happenings in a different way from his less-creative peers. His interpretations of problems deal less with details and facts of the problems and more with the hidden meanings and implications behind the facts. He has the ability to synthesize and collect meaning from a large variety of seemingly unrelated bits of information. The creative person sees beyond the immediate problem situation to the circumstances that may have given rise to the problem, and he is willing to take risks that

are adventurous, especially on problems that puzzle him. The creative student will often become pre-occupied with a solution to a difficult and complicated problem. Barron (1966), referring to creative professional writers, has said that they "seemed to thrive on disorder and responded by creating a new and, ...(for them)..., superior arrangement out of the confusion." The creative individual can be further characterized as one who is able to muster ideas that are "off the beaten track" and unsual. MacKinnon (1966), writes:

> ...One would not expect creative persons in their perceptions to be bound to the presented stimulus or object but rather to be intuitively alert to that which is capable of occurring, to that which is not yet realized; this capacity is, in fact, especially characteristic of the creative person.

Sense of Humor

One of the important characteristics for differentiating between the highly creative and the highly intelligent in the Getzels-Jackson study was the trait of humor or playfulness. Torrance (1960), in his partial replication of the Getzels-Jackson study, found very similar traits, and also reported that teachers rated the highly intelligent groups as more desirable, more ambitious and hard working, less unruly, easier to understand and more friendly then the highly creative groups. The creative group was also characterized by great curiosity and ability to ask penetrating questions and by showing more vivid imaginations with fantastic answers to certain questions and displaying, at times, a considerable lack of control, may often lead many teachers to view them as generally undesirable students.

There are a number of significant personality and intellectual differences between high creative and low creative groups which clearly and most interestingly differentiate the creative group from the other. Barron and MacKinnon have worked with creative writers, architects, and other groups. In a series of tests and interviews, they found that certain tests identify characteristics and attitudes which definitely differentiate the high creative from the low creative individual. Several of the tests and findings relative to characteristics of creative individuals are as follows:

The Minnesota Multiphasic Personality Inventory (MMPI): The MMPI was originally developed to measure tendencies toward major psychiatric disturbances, such as depression, schizophrenia and paraonia. Test results indicate that creative individuals tend to score high on the femininity scale. MacKinnon (1962) interpreted the higher scores to mean "an openness to their feelings and emotions, a sensitive intellect and understanding self-awareness, and wide ranging interests including many which in the American culture are thought of as more feminine." The same traits have also been observed and confirmed by other techniques of assessment. It is this openness of personality which, while allowing him to speak frankly and critically about himself and his experiences, sets him apart from others.

The Barron-Welsh Art Scale: This scale is part of the Welsh Figure Preference Test which presents the subject with a set of 62 abstract line drawings from

simple symmetrical figures to complex and asymmetrical figures. MacKinnon (1966) reported that all creative groups showed a clear preference for the complex asymmetrical figures. In general, the more creative the individual, the more likely he was to choose the complex asymmetrical figures.

Strong Vocational Interest Blank: On this particular inventory, the creative person represents himself as being relatively uninterested in small details or in facts for their own sake, but more interested in the meanings and implications that can be drawn from the facts. Most creative individuals in the groups studied by MacKinnon showed an interest in the professional occupations, such as psychology, and architecture; and a disinterest in occupations such as farming, carpentry, and law enforcement.

The Allport-Vernon Lindzey Study of Values: This test was designed to measure the relative strength of six human values conceptualized by the German psychologist Edward Spranger. Individuals are rated on the basis of their theoretical, economic, esthetic, social, political and religious values. MacKinnon (1966) has observed that all the creative groups he has studied scored highest on theoretical and aesthetic values. He has interpreted this observation to mean that the creative individual in the professions he studied seeks both truth and beauty in life and that "he has the capacity to tolerate the tension that strong opposing values create in him".

Research findings indicate that many of the characteristics which can be used to identify the creative person are similar for creative individuals at all levels from elementary school age through high school, college and adulthood. MacKinnon (1966) has ventured the guess that most young students with creative potential would be very similar to the mature adults he has been studying. However, longitudinal studies of the carry-over of differentiating characteristics from one age level to another and into adulthood are typically lacking.

TEACHING FOR CREATIVITY

It has long been an important objective of American education to develop each individual to his fullest capacity. Educators seeking to fulfill this objective must (a) know how to recognize individual differences in mental ability, motivation, personality and creative potential, and (b) know how to provide the opportunities for, foster, and fully develop each of these characteristics. Consideration will be given in this section of the report to what research has to say regarding the methods and techniques for encouraging, nurturing and enhancing creativity. Torrance (1963a) has asserted that "we cannot say that a child is fully functioning mentally if the abilities involved in learning and thinking creatively remain undeveloped".

Many teachers and school administrators have asked themselves and others, "How can the creativity which lies dormant in every individual child be developed and utilized as a universal human resource for the common good?" Crutchfield (1965) has reversed this question and stated positively that:

> An educational dilema today is that we must face the increasing

> need for individualized instruction, while the continuing growth of our mass educational system makes individualization less and less possible... . It is increasingly recognized that to make the instructional process optimal, account must be taken of the specific background, capabilities and distinctive attributes, needs and cognitions of a particular person. This does not mean, of course, that individuals must be taught singly, with different materials for each alone. It does require that common instructional methods and materials have such scope and flexibility as reasonably to fit the diverse requirements of the different individuals.

Torrance (1965b) has made the interesting suggestion that:

> Whenever teachers change their ways of teaching in significant ways, a different group of learners become the stars or high achievers. This advance has far reaching implications for educating a larger number of people to a higher level and for achieving a higher level of dignity and mental health in our society.

Cronbach (1957) emphasized that educators should not attempt to choose the "one best treatment" for all students; instead, they should select treatments (teaching methods) which are geared to the cognitive needs, abilities and personality traits of the individual. Crutchfield, Torrance, and Cronbach all would have teachers broaden their scope of teaching methods to fit the distinctive cognitive style of individual pupils. In general, the suggestion is for an application of a variety of teaching and learning methods tailored to fit the cognitive structure of different groups of learners.

Dozens of research studies have shown that people (children as well as adults) tend to learn most effectively in situations that they find rewarding. Torrance (1962a) suggested that some individuals have a preference for learning creatively: they learn a great deal if permitted to use their creative thinking abilities. Recent research findings suggest that many things can be learned more effectively and economically under conditions conducive to creative thinking.

The difference between learning authoritatively and learning creatively is similar to being told to learn something and seeking to learn something on one's own initiative. Authoritative learning is learning attributable to some authority such as a teacher, parent, older sibling, or a textbook, newspaper or magazine. The creative individual is normally unwilling to accept, without reservation, many undocumented items from an authority. Rather, he accepts them only after he has demonstrated their validity for himself. On the other hand, to learn creatively involves the student in sensing weak points in chains of knowledge about which he can make guesses and pose hypotheses, test and change these hypotheses, and unceasingly strive for solutions by methods which may be among the most fantastic. Finally, when the solution is arrived at, the creative individual has a desire to share this solution with others. The creative individual finds the solution to a problem and it matters little whether it also is the teacher's or the textbook's method of solution; it is a solution that he has found and there is little that is more significant to a creative individual than to find an answer to a perplexing problem.

There is increasing evidence to suggest that educators have over-emphasized the role of intelligence. By setting cut-off points for eligibility in special advanced school programs on the basis of IQ scores, they have assumed that the individual with a high IQ is also necessarily, more creative. Torrance (1960), Getzels and Jackson (1962), MacKinnon (1966), and others have reported that teachers show a decided preference for a child with a higher IQ over one with a greater measured creative talent. In the Getzels and Jackson study this occured in spite of the fact that both the highly creative group and the highly intelligent group were superior in IQ to the other students. As suggested earlier, if an individual meets minimum intelligence standards (which may be surprisingly low), then his performance on the job or in the field will depend more on non-intellectual factors. Educators would do well to develop all identified characteristics of the creative individual rather than limit their concern solely to intelligence.

The creative individual has an openness toward experience and an intuitiveness to judgement that is often a strong characteristic. There is also an absence of repression and suppression as mechanisms for the control of impulse and imagery. Discipline and self-control are necessary if one is to be truly creative, but it is also important that they not become over-learned. Once learned, they should be used flexibly and constructively. The danger lies not in openness toward experiences or in judgements of occurances, but in the possibility that the teacher, not seeing the causes behind the actions as creative, will criticize too soon and too often and thus cause the creative individual to repress his imagery and control his impulses. In the case of the creative person, the teacher must be able to perceive and accept the causes of disturbing and disruptive behavior as originating from strong opposites in the personality, rather than originating out of sheer rebelliousness. The difficulty, of course, lies in determining the motives behind disruptive behavior and differentiating between those with motives attributable to creativity and those with other motives.

In The Process of Education, Bruner (1960) has suggested that teachers, as well as others, should have children learn to grasp the structure of knowledge. If this is to be done, teachers must begin to place emphasis on the transfer of training from one situation to other different situations. If the student is going to develop some measure of intuitive thinking ability, it must be facilitated by the kinds of questions, attitudes, and rewards the teacher employs in his classroom practice.

Torrance (1964a) has reported that in a recent study in which all of the questions of several teachers, for several classes, over a period of time were analyzed as to the type of question used, 90 per cent of the questions were found to require only recall ability on the part of the students. Few questions called for thinking of any kind: creative, critical, convergent, evaluative, etc. In the classrooms where this is the case, the social climate is not conducive to creative self-expression and flexibility.

In another study reported by Torrance (1966a), 45 seventh graders were nominated by their teachers as highly likely to be dropouts. 95 per cent of the students thus identified indicated that they did not think anyone took their ideas and suggestions seriously, and 43 per cent also indicated they were afraid to ask questions.

These studies point out the lack of classroom atmosphere where creative activities are encouraged. Torrance (1963b) has listed fifteen methods that teachers can use to facilitate creative behavior in the classroom. The procedures were selected from many that have been presented from time to time in the literature. Several are listed here with very brief explanations.

Provide Opportunities For Creative Behavior: This can be done by making assignments which call for original work, independent learning, self-initiated projects and experimentation. In connection with appropriate questions and flexibility in the learning situation, this leads to a classroom atmosphere that is free for knowledge to be gained through the creative relationship between teacher and student. What knowledge is of most worth? Certainly knowledge that is applicable in a given situation is of value, but learning how to learn is even more significant.

Establish Creative Relationships With Children: A creative relationship between teacher and pupil requires a willingness on the part of the teacher for one thing to lead to another until the student sees the teacher as being on his side and becomes involved in the learning act. The environment thus created is a responsive one in which the child receives guidance, rather than detailed direction. Prolonged exploration without guidance eventually leads to the dissipation of energy and is a distortion of the creative process. Little that is creative can take place outside of an environment of creative relationships.

Give Purpose To Creative Writing: There is a difference in writing something to be corrected and writing something to be communicated. Itten (1964) suggests that "every correction in an essay has an offensive effect which destroys a child's natural story telling." Children have been found to write more imaginative, original and interesting stories when asked to do this rather that when asked to write while paying strict attention to form and correctness. Thus,if teachers will allow children to be creative for purposes other than correctness, they will receive more creative and original work.

Originality In Thinking: To evoke original thinking, it must be made clear that such thinking is expected and will be rewarded. Children, as well as adults, have been known to produce more if they know this type of thinking is expected, and are apt to do even better when they know this type of thinking will be rewarded. It is important not to allow peer or teacher evaluation to become too critical too soon. Freedom of thought, and expression of ideas by example, should be allowed and an openness ought to be encouraged toward all ideas, especially those which most challenge and/or threaten the teacher's judgements. The creative individual will often see relationships which teachers fail to see. These are the creative ideas that challenge the teacher and make him a better teacher because he too will increase his awareness of new ideas.

Reward The Student For His Ideas: It is important to reward students for their ideas by listening to them, considering them, evaluating them, using them, communicating them, and giving students credit for them. Teachers must be flexible in the use of prescribed curriculums and requirements so that unanticipated and different ideas, and the learning resultant from a child's own initiative, can be appraised. Ideas must first be developed and communicated before they can be properly evaluated. A teacher rewards his pupils not only by the grades he assigns but by what he encourages and discourages in the daily classroom routine and by the way in which he responds to the curiosity and questioning of his students.

Based upon a research study investigating eminent scientists, Roe (1953) has concluded that:

> Most of these subjects were fortunate enough somewhere along the line to have found a teacher who induced them to find things out for themselves, or who let them do so, or who insisted that they do so because he did not want to be bothered. Once intellectual independence was really tasted, nothing else mattered pedagogically....Certainty of his own worth is any man's greatest need.

INHIBITORS OF CREATIVITY

Of the research and literature dealing with creativity, one problem that has been most persistent and troublesome has been the identification of the inhibitors of creativity. Although Torrance and MacKinnon have given some clues to the experiences that inhibit creativity, most studies have been done for the purpose of identifying methods for developing creativity.

Perhaps the converse of the methods and techniques for developing creativity, which have been identified through research and reported herein, can give clues regarding the hinderance or inhibition of creativity. The following is a partial listing of possible hinderances to creative development.

Pressure to curtail imagination
Punitive approach to discipline
Societal conformity
Peer conformity--Peer pressure
Success oriented culture
Sex role emphasis
Equation of divergency with delinquincy
Definite division between work and play
Overemphasis on the acquisition of knowledge
Memorization of facts
Closely prescribed curriculum and required credits
Over-reliance on textbook or other authority
Lecture system of teaching
Departmentalization and vested interests

Expertness and specialization
Low prestige in our society of scholars, teachers, research workers
Too much criticism, too often
Requirements of group work
Teacher preference for high IQ over high creativity
Sanctions against questioning and exploration

These are suggestive of the many conceivable ways in which a teacher and/or a school system might retard the development of creativity. Granting that teachers are conscientious and hard working individuals and do not knowingly stifle creativity in children, many do so unwittingly by their classroom behavior. Wagner (1966), in a recent article, lists twelve common classroom practices which smother creativity. (An obviously important factor is that teachers and administrators are often unaware that their actions affect the performance of their students in many different ways). Actual practices which retard creative development are:

1. The traditional three-cycle pattern of the lesson: assign, read, and write
2. Undue emphasis upon assigned readings and written work
3. Inflexibility of daily schedules
4. Unwavering clinging to traditional practices
5. Disciplinary tactics which produce tension and anxiety
6. Teacher talk that dominates the day
7. Grading policies unrelated to creativity
8. Teacher insistence that things <u>always</u> be done their way and no other way
9. Lack of opportunities for students to follow concerns of personal interest

Indeed, it is even possible that a teacher might have seen the "pendulum swing both ways." It is conceivable for instance, that the teacher-student relationship of 20 years ago may actually have facilitated creative growth then, but will not do so today. Conditions in society, the home, and the school, as well in the teaching-learning situation, have changed so that techniques that contributed to creative development in the past may no longer operate in this way and may, in fact, have the opposite effect today.

CONCLUSIONS

It is a truism to say that we live in a changing world. Certainly the schools, as well as the larger society, are in a continued process of transformation. The lesson learned in order to cope with old problems may no longer be adequate. One cannot forsee with any exactness just what knowledge and skills will be needed in five, ten or more years to meet new and changing life requirements. Individuals can, however, evolve the attitudes and abilities of perception and thought that will help them meet future problems creatively and inventively. Students require a broad background of skills and knowledge. The schools can help young people acquire the independence of thought, leadership capabilities, initiative and a creative,

striving spirit needed to live productive lives in a changing world which requires of its inhabitants flexibility and an ability to adjust.

In 1959, at the University of Utah Research Conference on the Identification of Scientific Talent, a committee was appointed to study the effect of educational experience in the development of creative scientific talent. The committee reported that creative productivity can be developed and increased by deliberate procedures. Guilford (1952) stated even earlier that he believed creativity to be similar to most other learned skills and that it could be extended within the limits of the individual.

Sidney Parnes (1962), reporting on his experiences with a creative problem solving course at the University of Buffalo, stated that the students who had taken the one semester course were significantly superior in five or seven measures of creativity. He also pointed out that the experimental subjects showed significant gains in leadership ability, dominance and persistance. In follow-up studies to determine if there was any carry-over effect of their acquired abilities after eight months, and again after eighteen months, Parnes and his associates found that the experimental group was significantly superior on six criterion measures of creativity. Sommers (1961) has reported that a mastery of subject matter increased along with creative ability scores as a result of incorporating creative problem-solving exercises into existing courses.

Torrance has continually insisted that many things can be learned more economically and effectively by creative methods than by authoritative methods. He has admitted that not all teaching-learning situations can be successfully conducted in a creative atmosphere, but at least some of them can and should be handled in a creative manner.

It is obvious that creative potential is of importance to our nation and society. Often, in school environments, individual creative ability is so completely suppressed that existing potential goes unrecognized and un-developed. Our schools should provide the opportunities for the utilization and expansion of creative abilities in as many ways as possible. Further, they should develop methods and techniques for increasing individual success when these abilities are utilized.

No matter how much research is undertaken, it is the individual classroom teacher who must eventually incorporate the findings of this research into his daily teaching routine if individual creativity is to be developed. Often, when teachers care little for change, school systems will reflect this attitude and not provide the proper environment for the growth of creativity. The teacher who is aware of the findings of research regarding creative potential will be more likely to facilitate its development. Certainly we cannot afford to neglect the active promotion of creativity in the classroom.

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